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(71) Applicant(s)
FDI-Sambron
(Incorporated in France)
Route de Nantes, B P 71, 44160 Pontchateau, France

(72) Inventor(s)
Bernard Lambert

(74) Agent and/or Address for Service
Edward Evans & Co
Chancery House, 53-64 Chancery Lane, LONDON,
WC2A 1SD, United Kingdom

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(54) Abstract Title
Lift truck

(57) A lift truck 1 has a longitudinal beam 2 as its main structural member, said beam forming a box at one end and carrying a transverse shaft 6 for a lifting arm 4 at the other end. The top surface 16 of the beam may slope downwardly. The beam may carry a driving cab 7 on one side and an engine 9 on the opposite side, with the lifting arm in its lowered position lying between the two. The plates forming the beam may be provided with mortise and tenon joints such that it can be assembled prior to welding without the need for special tooling (fig 10). The arm 4 may be fixed or telescopic and may carry a variety of tools 8 at its end. The truck may be provided with stabilisers.

FIG.1

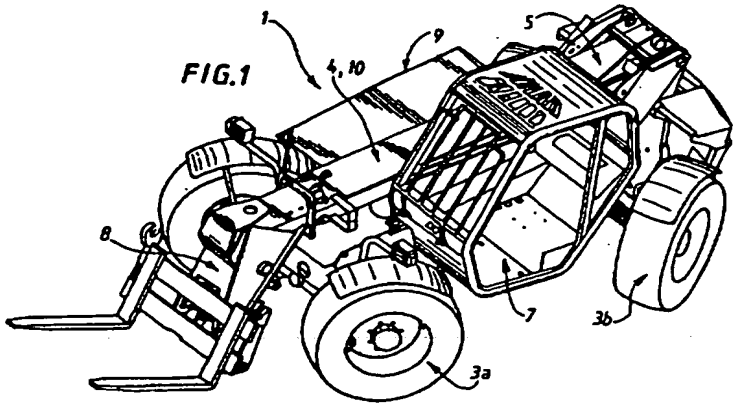
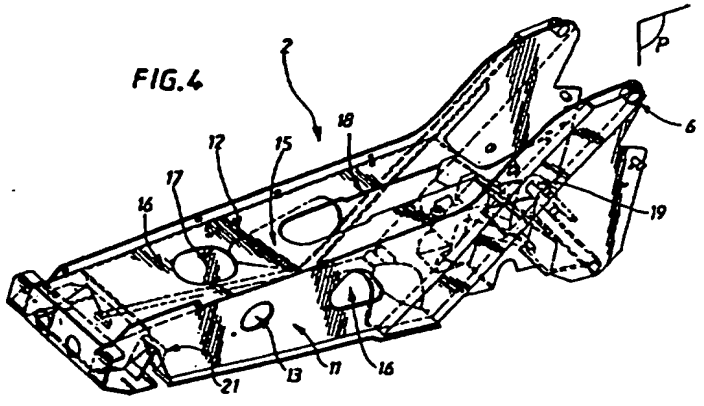


FIG.4



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

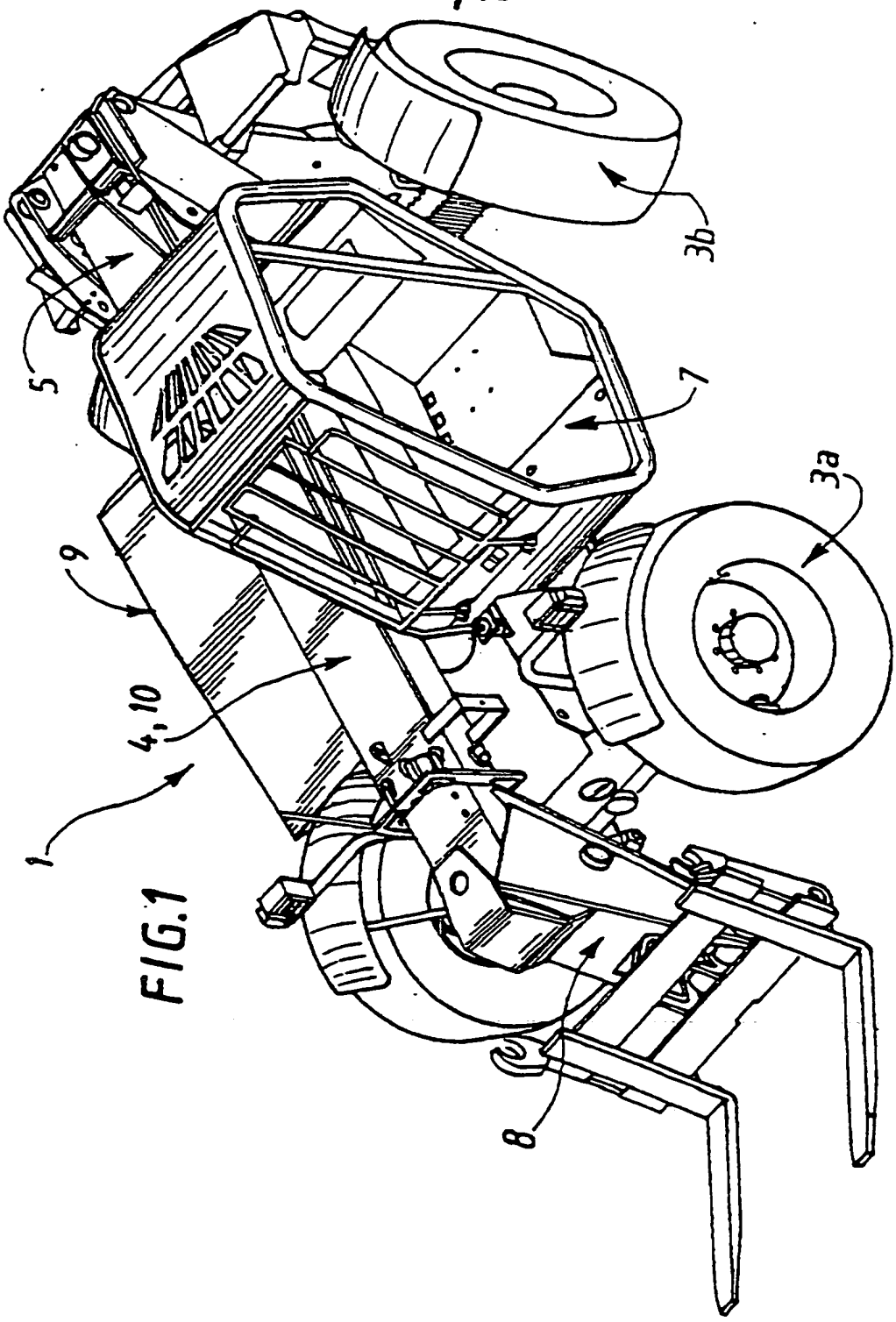
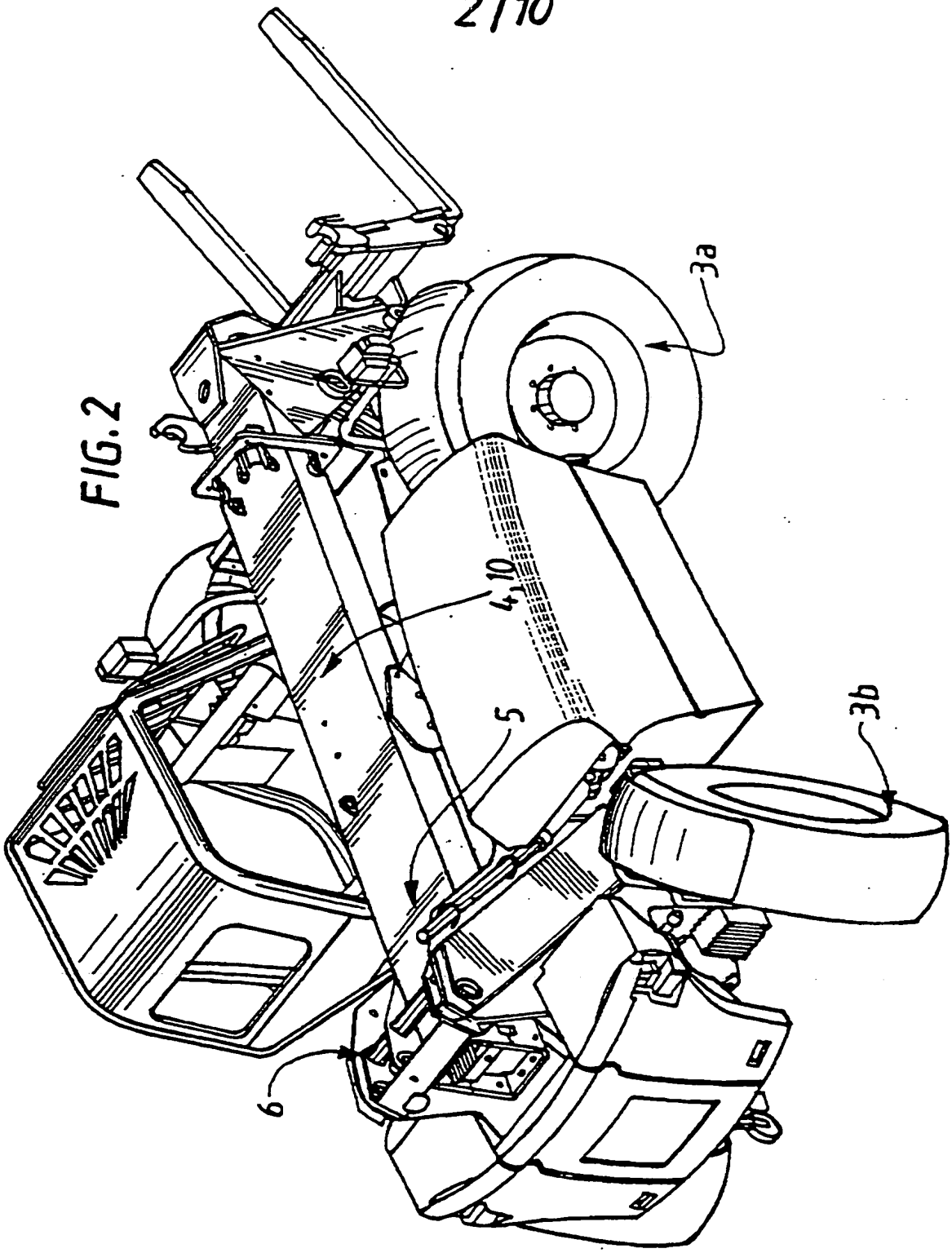


FIG.1

FIG.2



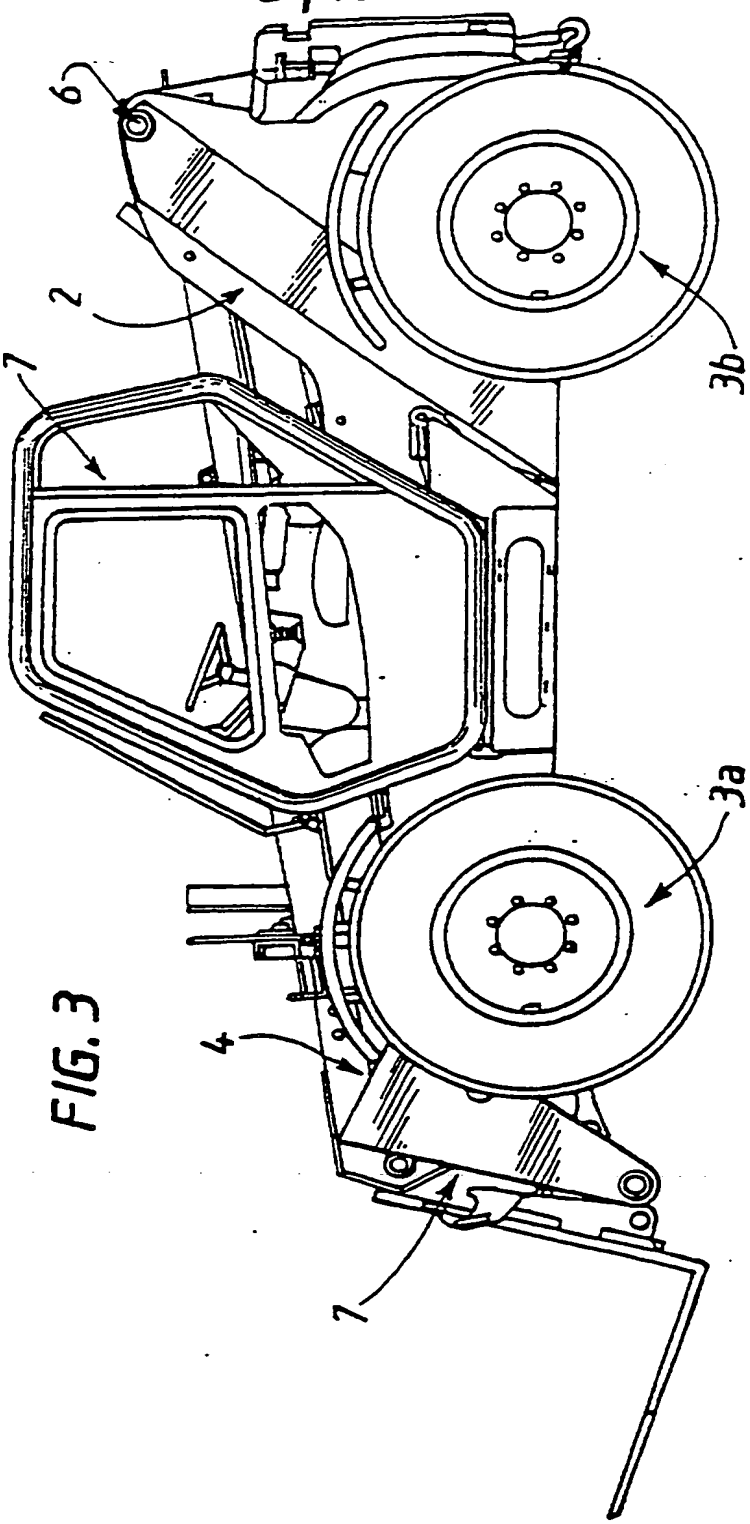


FIG. 3

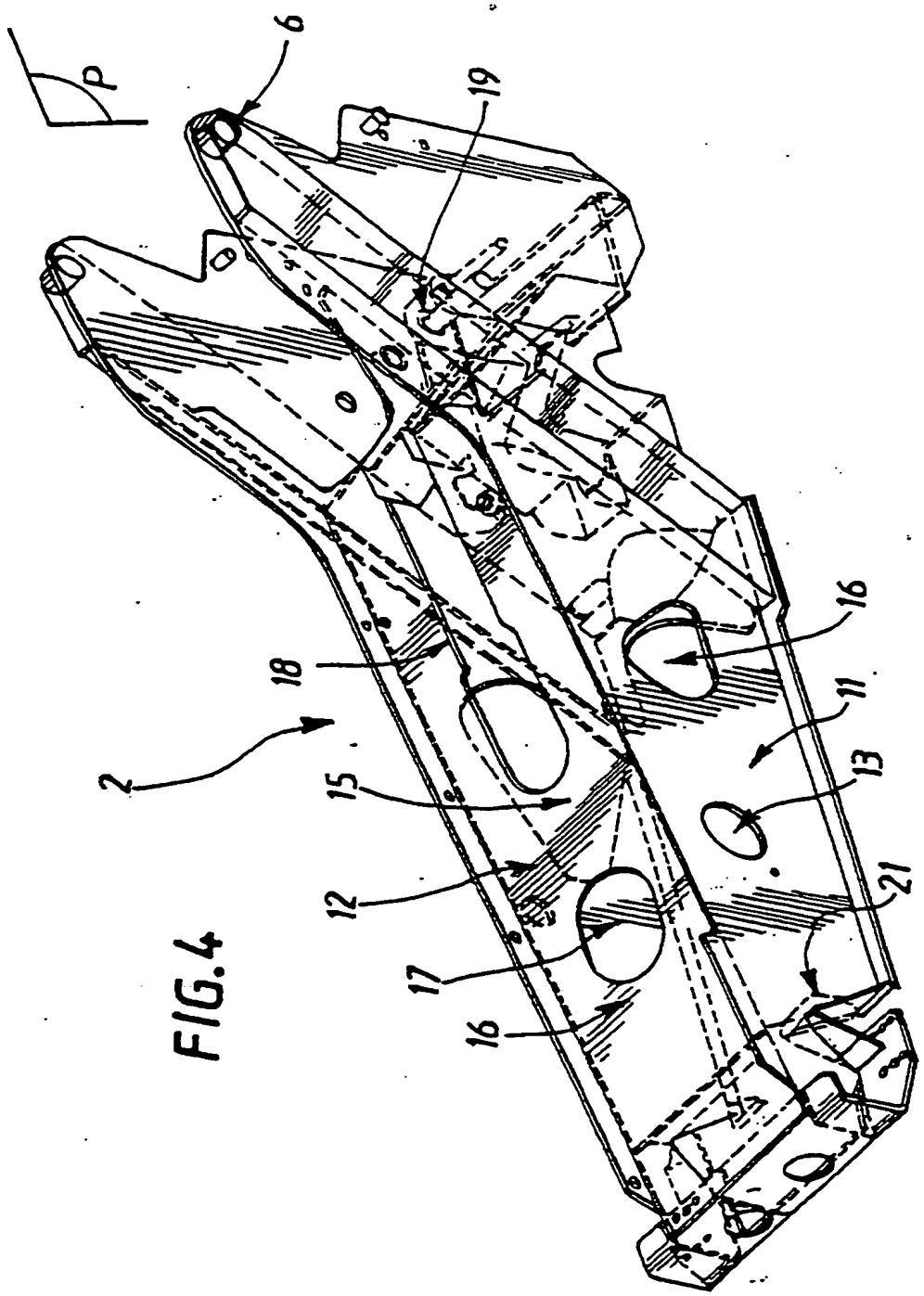


FIG.4

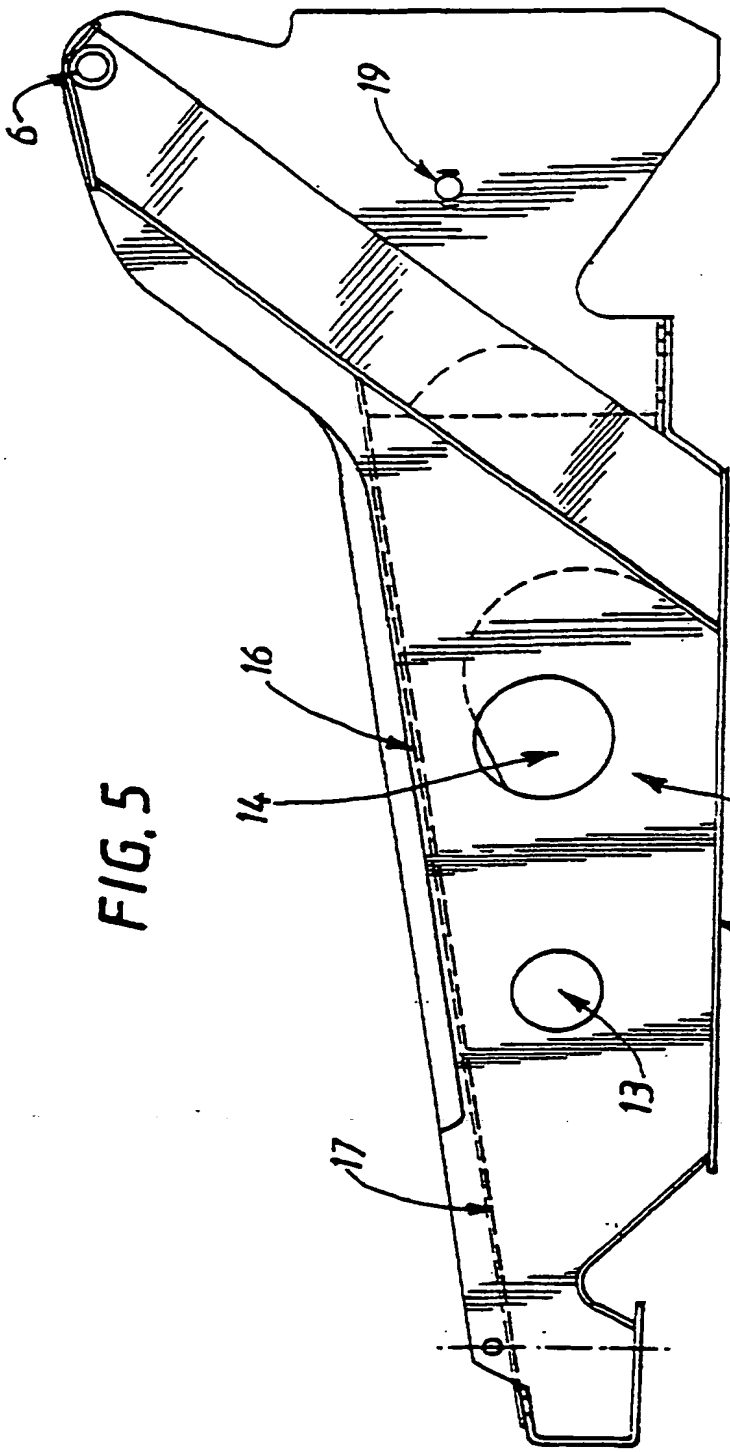


FIG. 5

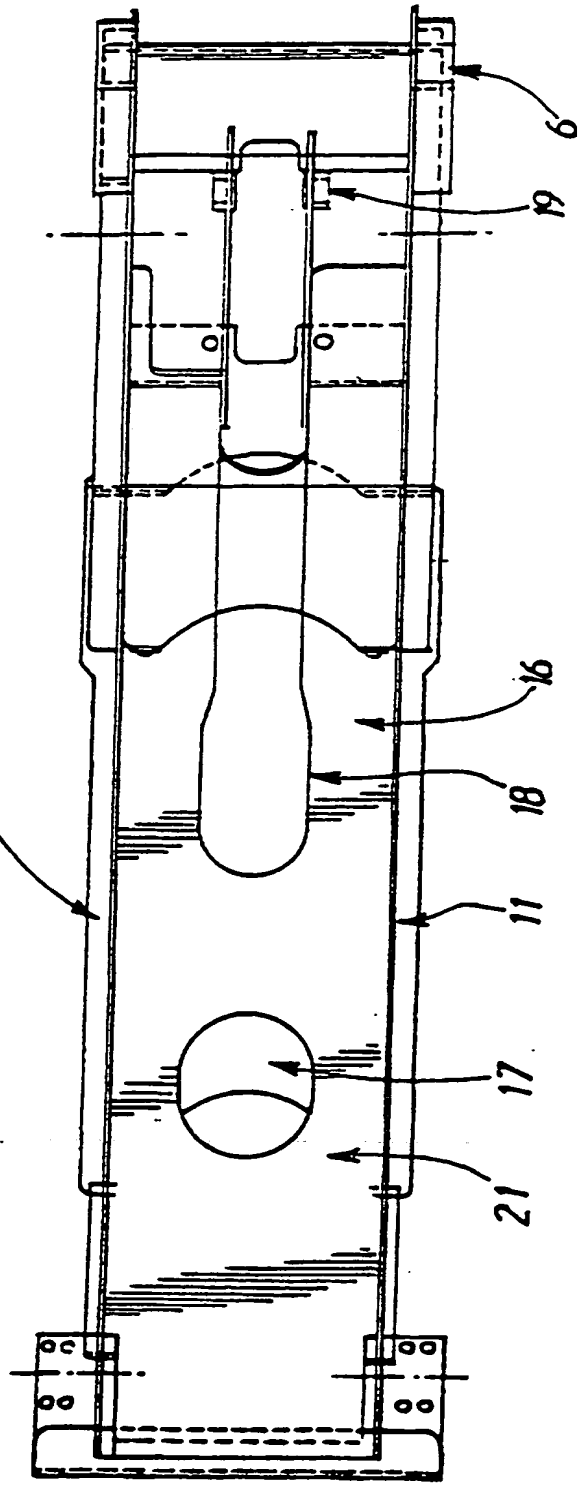


FIG.6

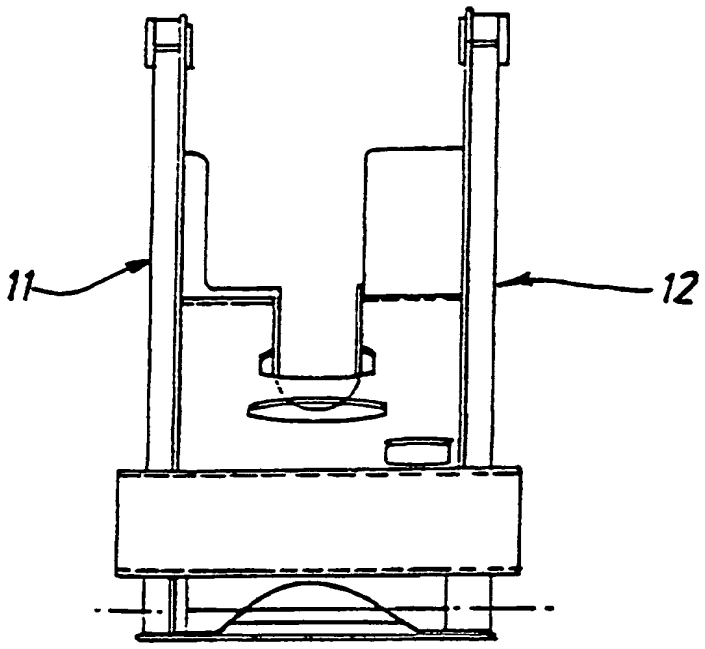


FIG.7

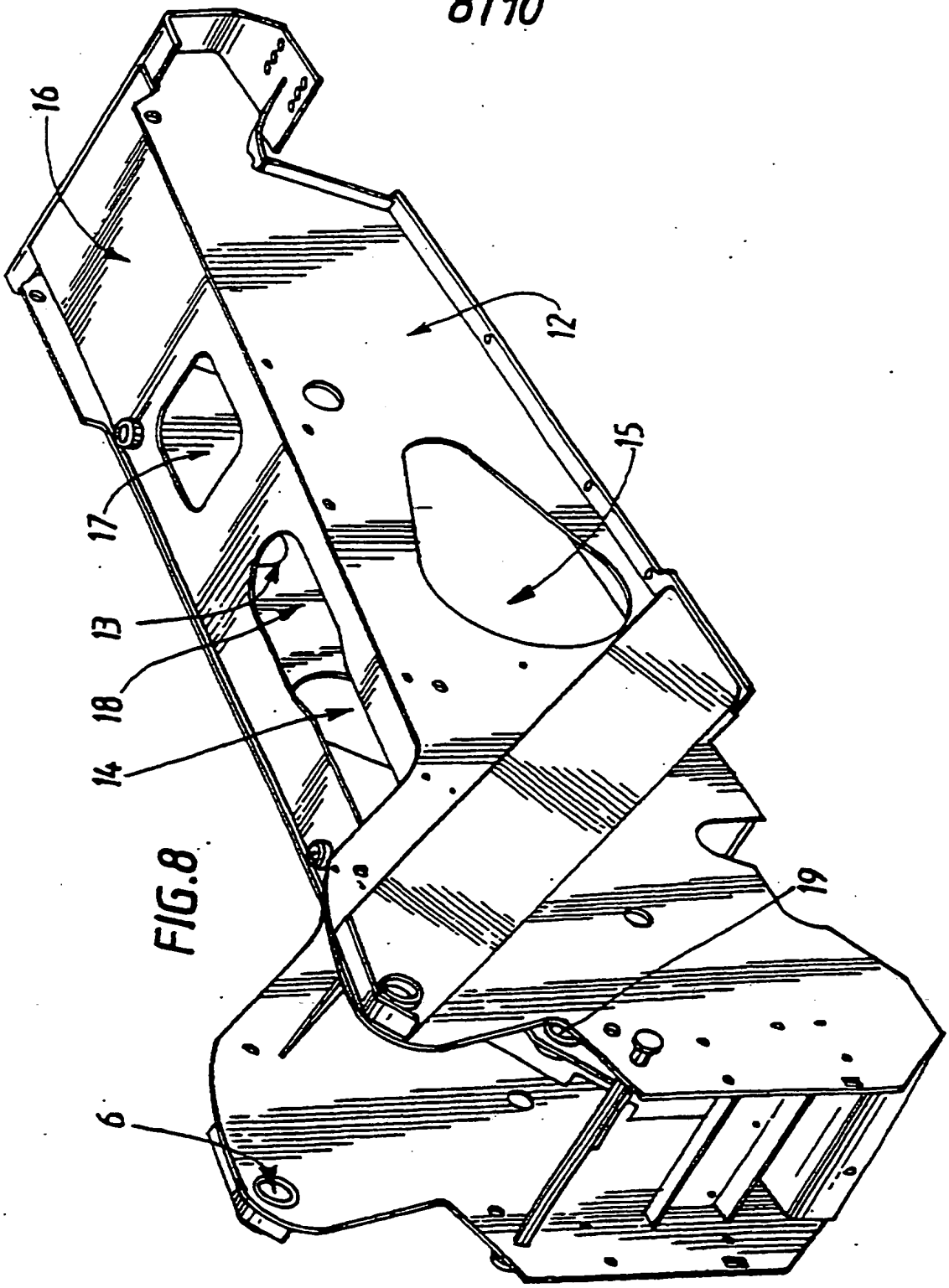


FIG.8

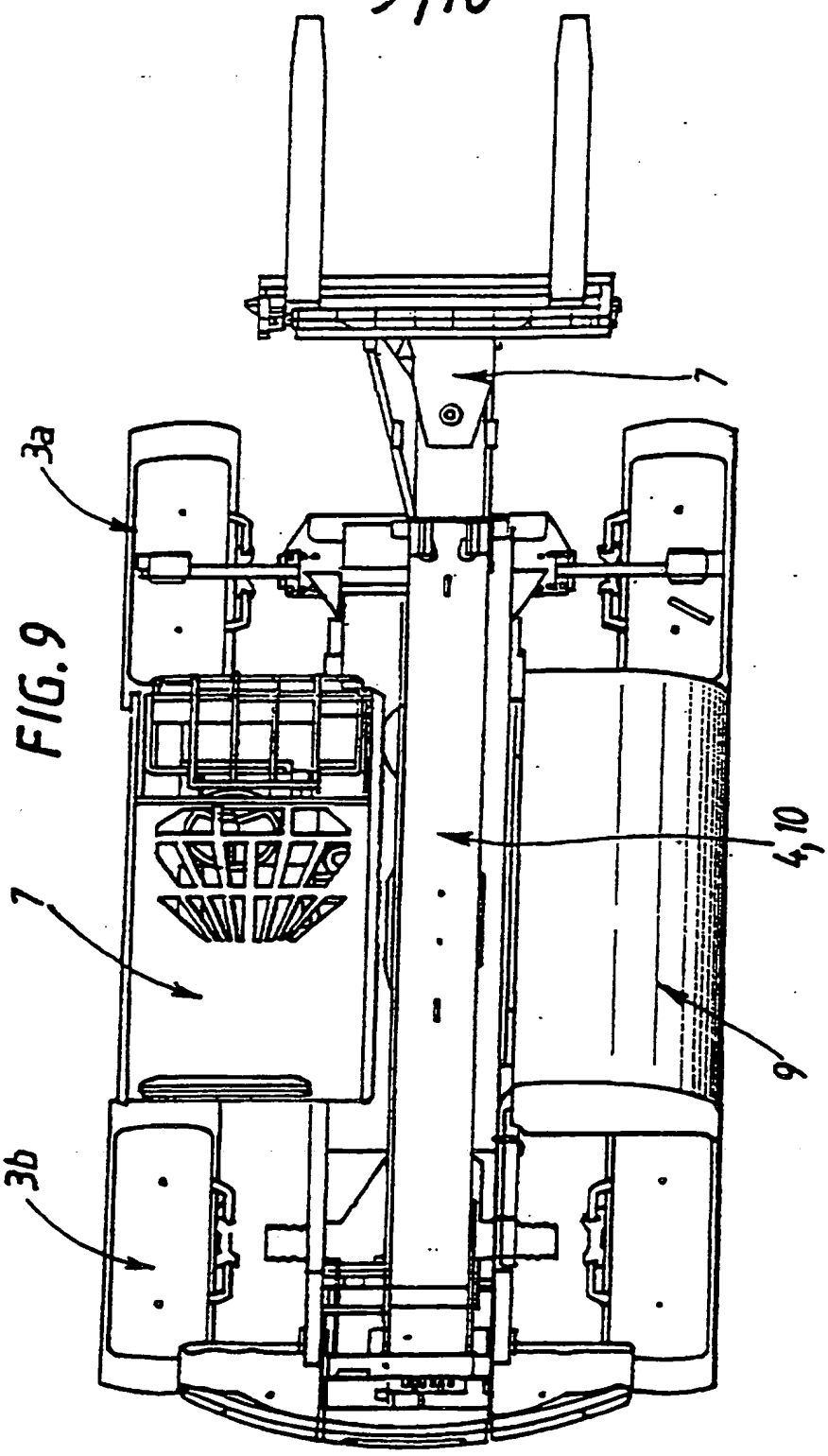


FIG. 9

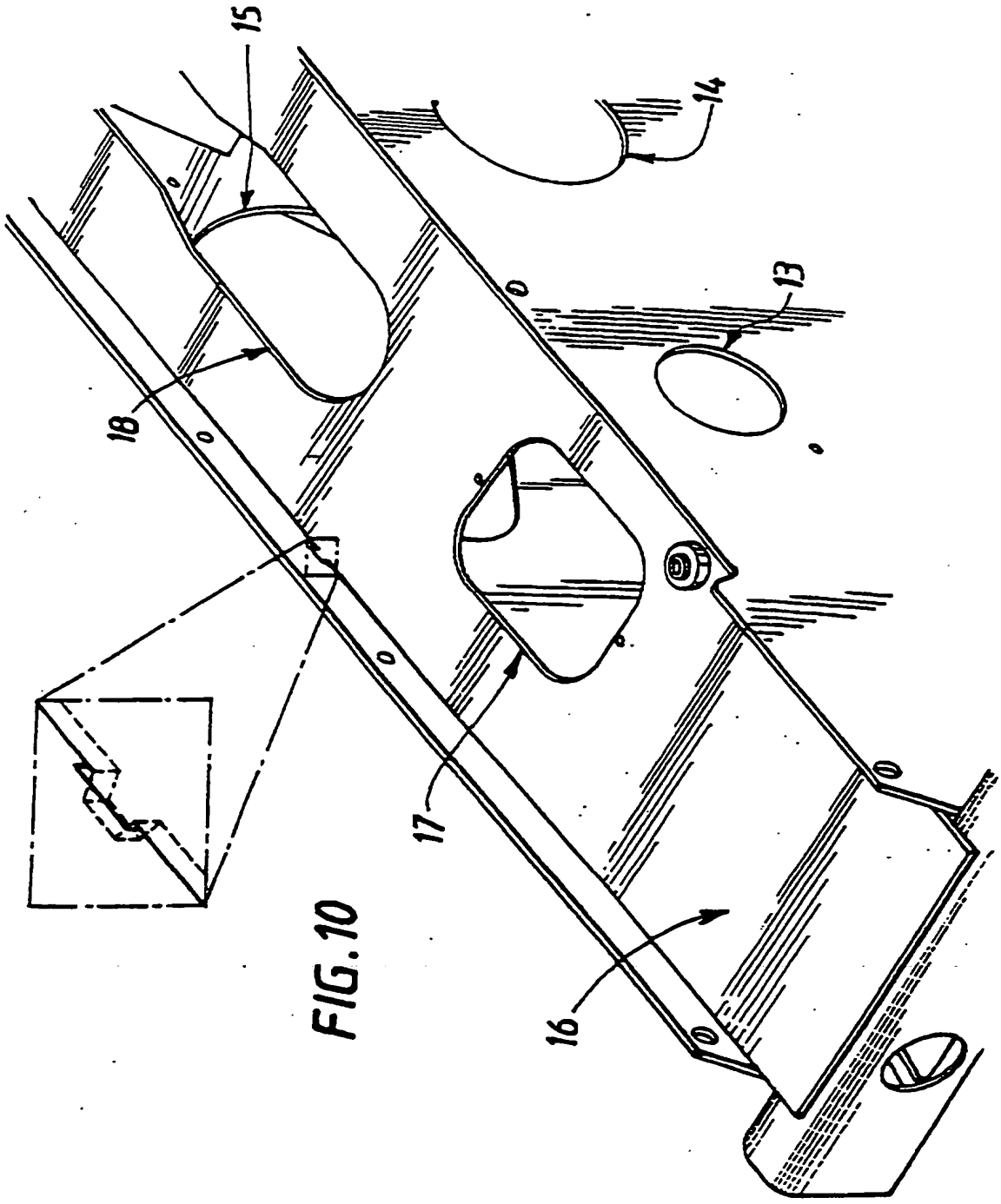


FIG. 10

BODY STRUCTURE FOR LIFT TRUCK

The invention relates to body structure for a lift truck, a lift truck having such a body, and a method of manufacturing such a truck.

Conventional lift truck bodies have two longitudinal members onto which a certain number of parts are fixed.

Reference can be made, for example, to the following documents: WO-92/02381, US-4.955 664, US-4.343 470, EP-B-110.415.

Such bodies are difficult to adapt to different engine, transmission and lifting configurations in particular. It is necessary to modify a major part of the structure of these bodies in order to produce trucks with different performances.

In order to resolve this problem, it has already been proposed to produce bodies in the form of a tank for fork lift trucks or the like.

Reference can be made, for example, to the following documents: WO-93/08064, FR-2.555.115.

These bodies in the form of a tank have limited stiffness, by their very design.

The document EP-A-311.853 describes an earth mover comprising a transmission casing formed by two profiled sections welded to form a hollow beam, the top wall of

which is provided with three openings for access to the transmission components.

This transmission casing occupies a central axial position.

The body of the earth mover described in the document EP-A-311.853 further comprises a second piece supporting the articulation of the movable arms of the machine, this second piece being fixed to the transmission casing.

The thermal engine is at least partly housed in this second piece.

Because of this, the body is difficult to adapt to different types and different sizes of engine.

In addition, the body described in the document EP-A-311.853 has a large number of parts, in addition to the transmission casing: two longitudinal members, a front plate and a rear plate thus forming for example a frame around the transmission casing.

Document FR-2.378.668 describes an agricultural or industrial tractor in which the cabin or seat for the driver is produced separately from the rest of the tractor and is mounted subsequently on the latter. Such a tractor cannot have a body, the cabin being fixed to the front and rear axle supports of the tractor.

The stiffness of such a structure is not compatible with the mechanical forces encountered during the use of lift trucks.

Document FR-2 681 304 describes a fork lift truck, consisting of two pre-assembled groups. The first group comprises essentially the driving station and the roof for protecting the driver, whilst the second comprises essentially the body, the counterweight, the running gear and the elements fixed to the aforementioned parts, this second group being designed to receive a battery, whilst

an intermediate body can be mounted between the two pre-assembled groups.

Document FR-2.681.304 does not relate to the lift trucks of the invention.

The lift trucks of the invention are of the self-propelled type and have a single arm, possibly telescopic, articulated in the rear half of the body. The engine is disposed laterally, on the opposite side to the driving cabin, and the lifting arm extends in a longitudinal direction substantially median to the truck.

This relative arrangement of the cabin, engine and lifting arm is known.

Reference can be made chronologically, for example, to the following documents:

US-3.836.025, DE-2.739.325, GB-2.161.784, WO-88/00647, EP-325.064, EP-415.608, US-5.478 192, EP-577.388, EP-581.345, EP-680.923, EP-681.068, EP-692.448.

Such an arrangement of the cabin, engine and lifting arm has the following advantages:

- good lateral visibility for the driver positioned at the driving station, this driver not being hindered by the lifting arm when this arm is in the completely lowered position;

- good rear visibility: since the power unit is not disposed, unlike some trucks, underneath the articulation shaft of the lifting arm, this articulation and its support can be lowered.

The invention relates to a body having a monobloc self-supporting beam structure, designed so that a wide variety of lift trucks of the type presented above can be produced, from this body.

The invention further relates to a lift truck comprising such a body and to the method of manufacturing such a truck.

The invention allows easy manufacture of a wide range of lift trucks of the type presented above, from a single body, of simplified design and inexpensive.

The invention concerns a body for a working vehicle such as a lift truck, having a monobloc self-supporting beam structure, elongated in a substantially longitudinal direction of the vehicle, this body forming a box on its extreme front part side and supporting at least one substantially transverse rotation shaft for an arm, at its extreme rear part.

In one embodiment, the body has two substantially vertical lateral plates, a top plate inclined with respect to the horizontal and a substantially horizontal bottom plate, the plates forming a box in the extreme front part of the body.

The invention relates, according to a second aspect, to a lift truck comprising a body such as the one above, also having:

- a driving cabin, disposed laterally;
- an engine, disposed laterally, opposite the driving cabin;
- a longitudinal lifting arm, disposed, in the completely lowered position, between the casing of the engine or motor and the driving cabin.

The invention relates, according to a third aspect, to a method of manufacturing a lift truck such as the one above, the method comprising the steps of:

a) fabricating the body;

b) manufacturing the exchangeable modules designed to be fixed to the body, namely:

- the engine pod and its accessories;
- the driving cabin;
- the arm, possibly telescopic;

c) assembly of the modules on the body

steps a) and b) being carried out in separate places.

In one embodiment, the assembly of the body is carried out by pre-positioning the plates with respect to each other by means of connections of the mortise and tenon type, before carrying out the welding, this welding thus requiring no special tools.

Other objects and advantages of the invention will become more apparent from the following description of one embodiment, a description which will be made with reference to the accompanying drawings in which:

- Figure 1 is a front three-quarters perspective view of a lift truck according to the invention;
- Figure 2 is a rear three-quarters perspective view of the truck shown in Figure 1;
- Figure 3 is a lateral schematic view of the truck shown in Figure 1;
- Figure 4 is a front three-quarters perspective view of the body of the truck shown in Figure 1;
- Figure 5 is a lateral view corresponding to Figure 4;
- Figure 6 is a top view corresponding to Figure 4;
- Figure 7 is a rear view corresponding to Figure 4;
- Figure 8 is a rear three-quarters perspective view of the body shown in Figure 4;
- Figure 9 is a top view of the truck shown in Figure 1;
- Figure 10 is a detailed view of Figure 4 showing the principle of the mortise and tenon mounting of the body.

The lift truck 1 comprises a body 2 mounted on four wheels, namely two front wheels 3a and two rear wheels 3b.

In the remainder of the text, the terms "front" and "rear" are employed with reference to the driver seated in the cabin of the driving station.

The terms "longitudinal" and "transverse" are defined with respect to the wheelbase of the truck.

The truck comprises an arm 4 which is movable in rotation by means of its base 5 with respect to body 2 about a shaft 6.

This shaft 6 is horizontal and substantially orthogonal to the longitudinal direction of the vehicle. In the figures, arm 4 is shown in the low idle position.

In the embodiment shown, arm 4 is telescopic.

In other embodiments, not shown, arm 4 is formed by a single element.

Arm 4 has at its free end a tool carrier 8 for fixing various tools such as earth-moving and recovery buckets, a palletizer with or without traverser, multiple buckets, crane jib, a backfill blade, mechanically- or hydraulically-opening concreting buckets, a sweeper, a platform, a fork, a hydroclaw, a log clamp, a spreader bucket with screw and, in general terms, any tool for lifting or handling in the fields of agriculture, building, civil engineering or moving activities.

In the embodiment shown, the tool holder integrates cross members of the FEM III type which can receive forks or other tools.

In one embodiment, the front axle is rigid or oscillating with respect to body 2, whilst the rear axle is oscillating with respect to body 2.

Four wheels 3a, 3b are driving and steering and have equal dimensions in the embodiment shown.

Truck 1 can be provided with stabilisers, such as skids, at the front end of the body 2, beyond front wheels 3a.

Truck 1 can also, where necessary, be provided with stabilisers at the rear end of body 2, the front and rear stabilisers being arranged symmetrically with respect to body 2.

Locking of the oscillation of the front axle and/or of the rear axle can be provided for when these axles are free.

Truck 1 comprises a side driving cabin 7, situated substantially halfway between front 3a and rear 3b wheels.

This cabin is situated substantially on the left hand side of body 2, arm 4 extending substantially along the median longitudinal vertical plane of the vehicle.

The truck comprises a power unit. In the present example, the engine is an internal combustion engine.

The engine is oriented with its axis horizontal and substantially orthogonal to the longitudinal direction of the vehicle. The axis of the engine is therefore transverse.

Casing 9 of the engine is situated substantially on the side of body 2 opposite to cabin 7, being situated here on the right-hand side of the vehicle.

Shaft 6 of arm 4 is situated substantially halfway up driving cabin 7. The height at which the eyes of the driver, seated in cabin 7, are situated on average is very close to the top of this cabin and passes through the upper quarter thereof.

It therefore substantially exceeds the level of shaft 6 of arm 4 so that the driver obtains very good side and rear visibility.

At least one cylinder of a conventional type enables arm 4 to be moved in rotation about shaft 6.

The cylinder(s) extend(s) in the longitudinal direction of the vehicle so that it or they can be

situated immediately underneath arm 4 in the idle position of the arm.

Cabin 7 of the driver is placed at a sufficient height for the upper half of cabin, having the glazed surfaces, to be higher than the upper face 10 of the arm.

This arrangement enables the driver to obtain good side visibility, over arm 4.

Reference is now made to Figures 4 to 8.

Body 2 of truck 1 has substantially a monobloc self-supporting beam structure.

Body includes two substantially vertical lateral plates 11 and 12 symmetrical with respect to a plane P, substantially median to truck 1.

Plate 11 has a series of openings 13, 14.

In the embodiment shown, these openings 13, 14 are intended for passage of the clusters of hydraulic and electrical circuits connected to the controls arranged in the driving cabin.

Likewise, plate 12 has an opening 15.

This opening 15 is intended, in the embodiment shown, for passage of the end of a hydraulic pump placed at the end of the shaft of the thermal engine.

The body has a top plate 16 inclined with respect to the horizontal and rigidly fixed to lateral plates 11, 12.

This top plate 16 has, in the embodiment shown, two openings 17, 18.

Opening 17 forms a hole for access to the transmission.

Opening 18 enables the cylinder moving arm 4 about shaft 6 to come to be housed at least partially below the level of the top plate 16 when arm 4 is in the completely lowered position.

Body 2 supports, at its extreme rear part, the articulation shaft 6 of arm 4.

This monocoque body 2 forms a box and provides a rigid connection, of equal strength, and light weight, between equipment arm 4 and the axles.

The box formed by body 2 contains and protects the mechanical and hydrostatic transmissions, and the pipework of the hydraulic or other circuits.

This body supports, at its extreme rear part, the shaft 19 for articulation of the cylinder moving arm 4.

Bottom plate 20 of the body is substantially horizontal and has a front edge 21, facilitating the fitting of the front axle when the truck is assembled.

This body serves as a main frame which can receive exchangeable modules, produced separately, such as:

- engine pod and its accessories of the reservoir, battery, air filter or other types;
- cabin;
- lifting arm;
- ballast;
- stabilisers.

As shown in Figure 10, when body 2 is assembled, the assembly of plates 11, 12, 16, 20 in order to form a box in the front part of the body is carried out by mortises and tenons, so that no special tooling is required for the subsequent welding.

CLAIMS

1. A body for a working vehicle such as a lift truck (1), having a monobloc self-supporting beam structure, elongated in a substantially longitudinal direction of the vehicle, this body (2) forming a box at its extreme front part and supporting at least one substantially transverse rotation shaft (6) for an arm (4), at its extreme rear part.

2. A body according to Claim 1, characterised in that it has substantially vertical lateral plates (11, 12), a top plate (16) inclined with respect to the horizontal and a substantially horizontal bottom plate (20), the plates (11, 12, 16, 20) forming a box in the extreme front part of the body (2).

3. A lift truck comprising a body according to either one of Claims 1 or 2, characterised in that it further includes:

- a driving cabin (7), disposed laterally;
- an engine, disposed laterally, opposite the driving cabin (7);
- a longitudinal lifting arm (4), disposed, in the completely lowered position, between the casing (9) of the engine and the driving cabin (7).

4. A method of manufacturing a lift truck according to Claim 3, characterised in that it includes the steps of:

a) fabricating the body (2);

b) manufacturing the exchangeable modules designed to be fixed to the body, namely:

- the engine pod and its accessories;
- the driving cabin (7);
- the arm (4), possibly telescopic;

c) assembly of the modules on the body (2)

steps a) and b) being carried out in separate places.

5. A method according to Claim 4, characterised in that the assembly of the body is carried out by pre-positioning the plates (11, 12, 16, 20) with respect to each other by means of connections of the mortise and tenon type, before carrying out welding, this welding thus requiring no special tooling.

6. A body, substantially as hereinbefore described with reference to the accompanying drawings.

7. A lift truck, substantially as hereinbefore described with reference to the accompanying drawings.